# Potentiostat

## User Manual

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# 1 Safety instructions

There are no serviceable parts inside the device. So, there is no need for the user to open the device. If one or more Power supplies fails (led indicators), or when other problems occurs, please contact the “Elektronicagroep FEW”.

# 2 General information

The potentiostat is a highly-specialized power supply/power amplifier used to maintain constant potential across two electrodes, of a electrochemical cell, by varying the conditions of a third one. The desired potential between the “working” end “reference” electrode (Eref) is delivered by a external supply and kept constant by the counter electrode. The reference potential will be varied and the current flowing into the counter is measured. The connection between these quantities is shown in a XY-graph.
Just when a measurement is performed the cell is connected to the potentiostat, otherwise it is switched off.

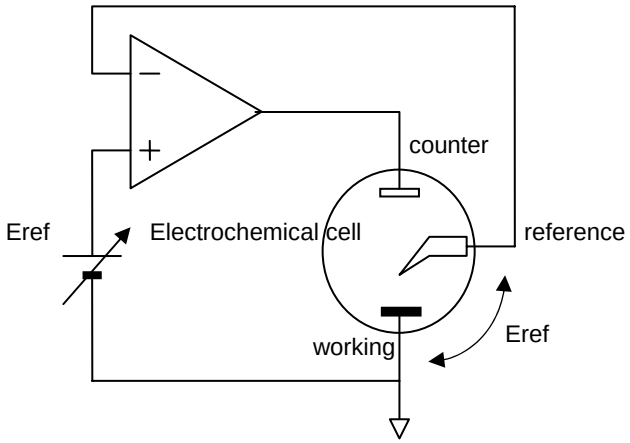


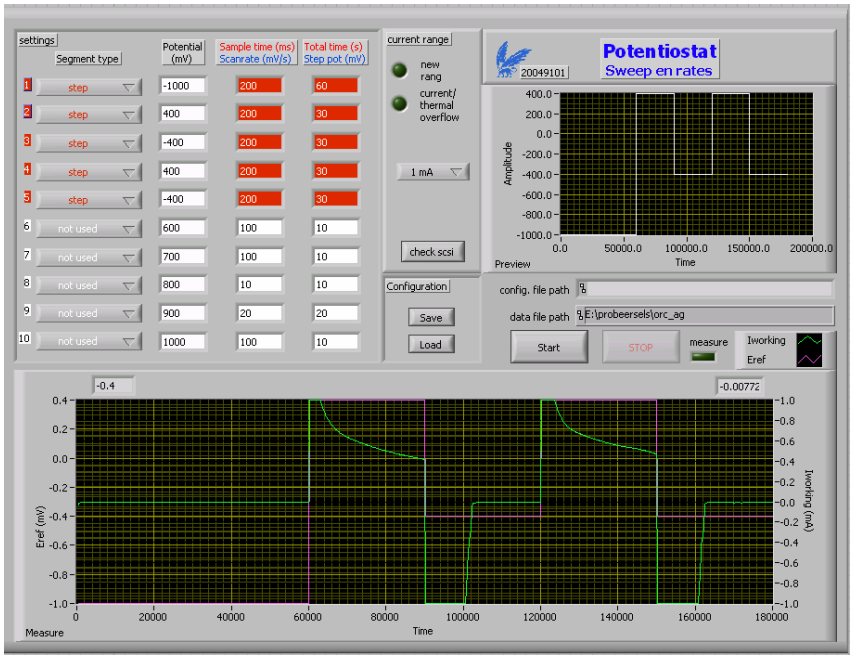

Fig. 1 Schematische voorstelling van een potentiostaat

# 3 User guide

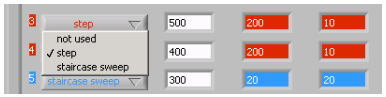
The measurement is controlled by two LabView programs:
Potentiostat Sweep and rates
Potentiostat Cyclic Voltametry
To do so there is a National Instruments Data Acquisition Card required: type PCI-6014.

## 3.1 Sweep and rates

In this mode you can create your own waveform for the reference potential. Waveforms can be saved for later use and, as a matter of fact, load from disk. Both the reference potential as well as the working electrode current are plotted against time.
Once the settings are established, the experiment can be initiated by the “Start button”. Before the experiment starts, you will be asked where to store your data.
Once the “start button” is pushed, no more changes in the settings are possible. The measurement is stopped by the “stop button” or ad the end of the cylcus.

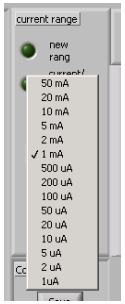


### 3.1.1 Settings




The waveform can be composed in maximum 10 steps. In each step one can use a “step”, a “staircase sweep” or disable this step (not used). The meaning of the values in the middle and right column differ for step and staircase mode. The potential column gives the end potential for the particular step. The starting potential is the end potential from the previous step. In the preview window the composed waveform is showed.

### *3.1.2 Current range*




The expected countercurrent can be chosen with the help of a pop-up menu.

### *3.1.3 Configuration*

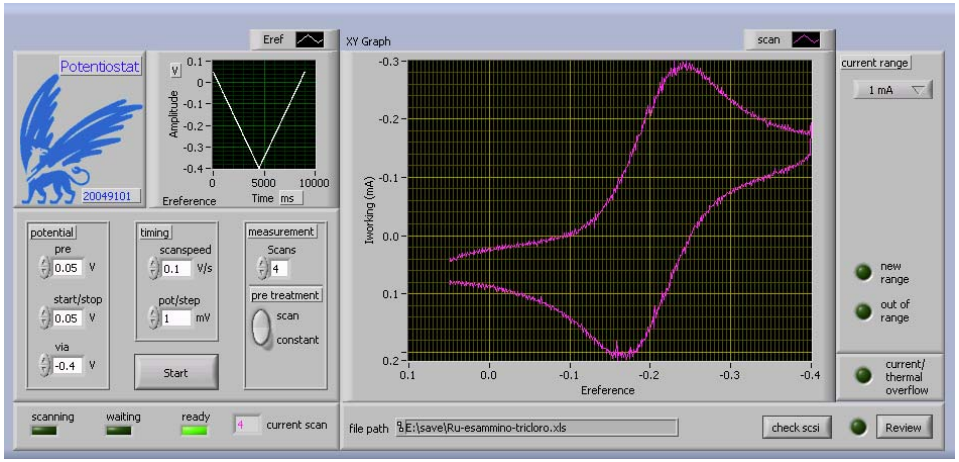
Two buttons are available: “save” the composed configuration to file and “load” a configuration from file. Settings will be saved separate from the measuring data.

### *3.1.4 Graphs*

Two graphs are used. Preview shows the composed waveform and Measure shows Y-time plots of both the reference potential and the working electrode current.

## 3.2 Cyclic Voltametry

In this mode the reference potential is changed in time. The stop potential must have the same value as the start potential. (cyclic). The reference potential is plotted against the working electrode current in an XY-graph.
Once the settings are established, the experiment can be initiated by the “Start button”.
Once the “start button” is pushed, no more changes in the settings are possible. Three Oblong Led’s indicate the status of the experiment. The E_reference_window shows the curve of the reference potential as a function of the time. The first scan can differ from the others if “start potential” is not equal to the min or max potential.
After the experiment is done one of the former scans can be reviewed with the “Review button”

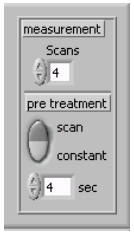



### *3.2.1 Settings*

- Potential
  Start/stop: Start and stop potential.
  Pre: Maximum potential.
  Via: Minimum potential.
- Timing
  Scanspeed: Potential increase or decrease speed
  Pot/step: Potential increase or decrease per step.

Measurement

- Scans: Number of scans in an experiment.




- Pretreatment: Waiting time before the first scan starts if “constant” is chosen. If “scan” is chosen a scan from the pre potential to the start potential is performed before the first scan begins.

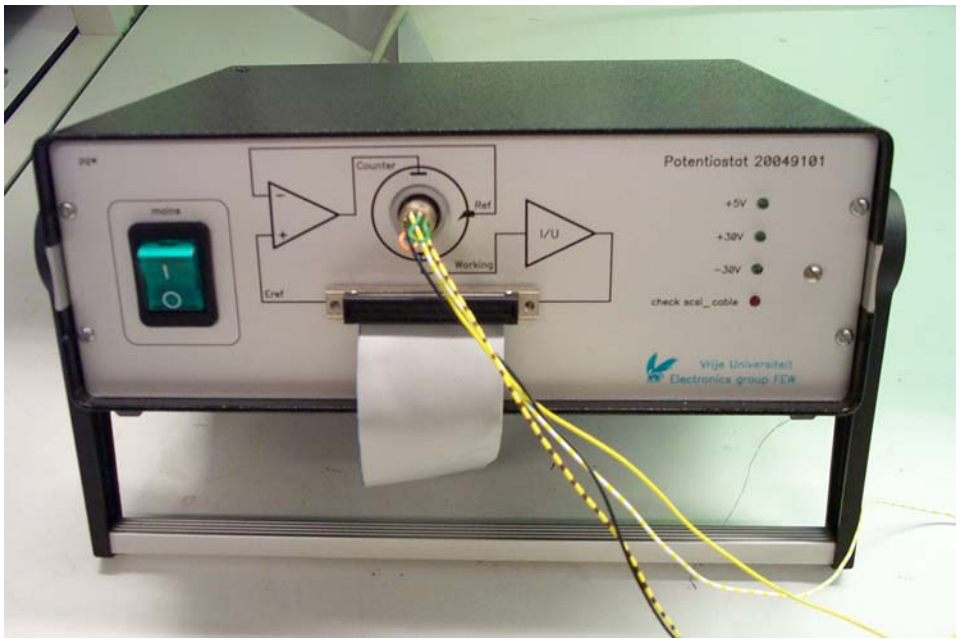
- Current Range
  The expected countercurrent can be chosen with the help of a pop-up menu.

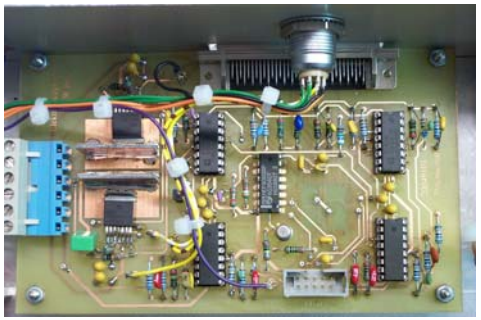
### *3.2.2 Graphs*

Two graphs are used. The E_reference_window shows the curve of the reference potential as a function of the time. XY_graph_window shows the reference potential versus the counter current.

# 4 Connections

The potentiostat is connected to the Data Acquisition Card via a flat cable with wide scsi_connectors.
The electrochemical cell is connected with the help of an 8_pin Lemo Connector When this plug is removed the power of the amplifiers is disconnected.



# 5 Specifications

### 5.1.1 Power consumption

### 5.1.2 Fuses

There are three fused power supplies involved with the potentiostat. All of them are 100mA.
A fused mains chassis plug is used with 100 mA slow fuses.

### 5.1.3 Technical specifications

# 6 In Labview used formulas

| | | |
|---|---|---|
| dV | = | Vmax – Vmin |
| amplitude | = | dV/2 |
| offset | = | 2xdV +Vmin |
| phase | = | offset + (Vstart – offset)x 90/(Vmax – offset) |
| Tscan | = | 2xdV/scanspeed |
| frequency | = | 1/Tscan |
| #samples | = | 2xdV/(pot/step) |
| updaterate | = | #samples/Tscan |

Counter current and reference potential
The current range is from 10 uA to 50 mA
The reference potential is from -10 to +10 volts.